

Overview of PHOBEA Results in the NE Pacific During Spring 2001

by

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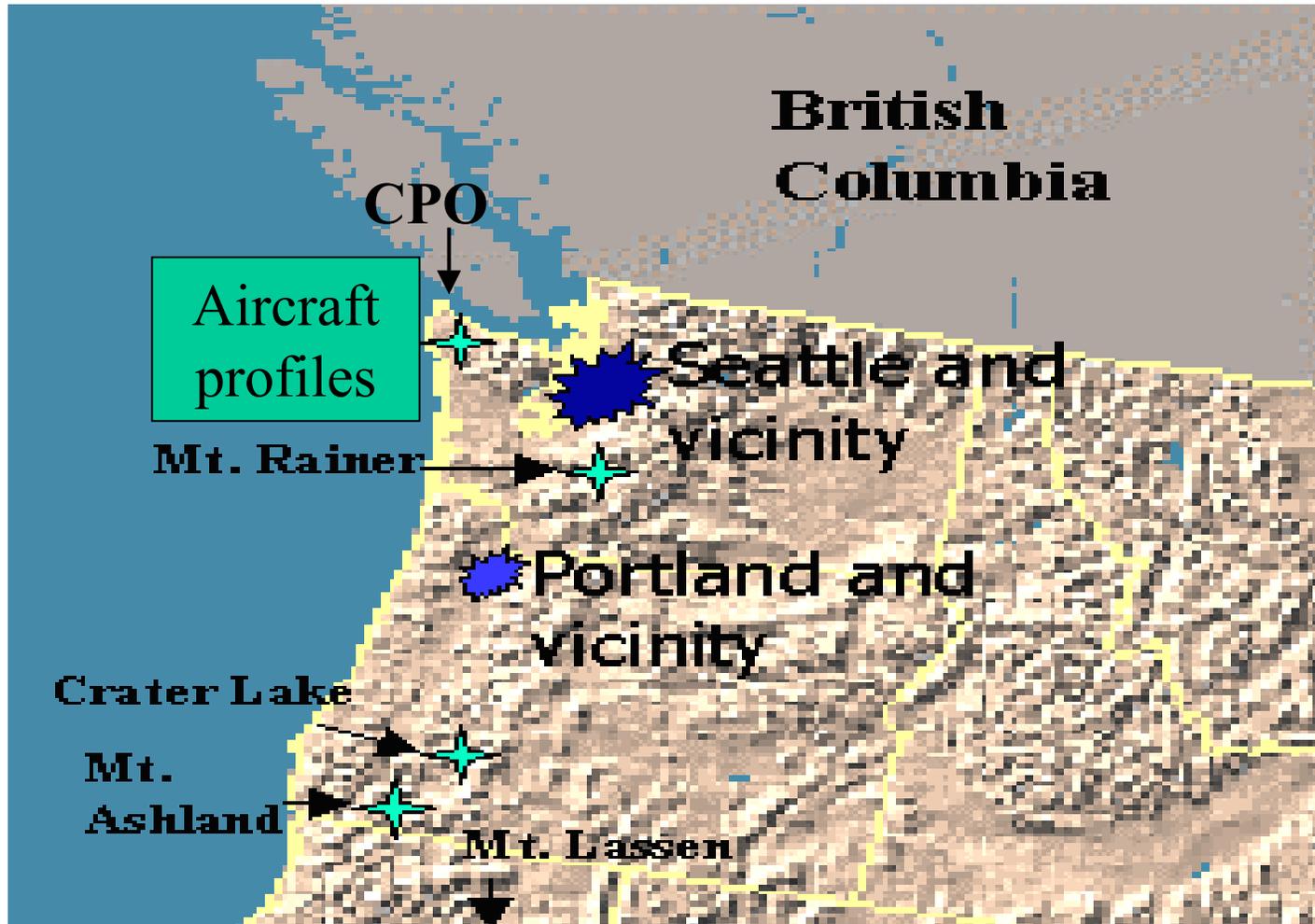


Primary PHOBEA Objectives

- **Evaluate role of in-situ O₃ production on ozone budget;**
- **Evaluate sensitivity of O₃ production to PAN and other factors;**
- **Determine role of upstream sources including industrial emissions, fires and deserts on budgets of CO, O₃, NMHCs, NO_y, aerosols, and toxics (Hg and POPs);**
- **Identify synoptic conditions associated with long range transport of pollutants from Asia;**
- **Coordinate with various modeling groups to use and evaluate regional and global models in both post and forecasting modes.**

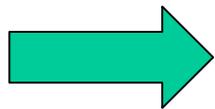


PHOBEA Study Area



Previous PHOBEA Campaigns

- **Spring 1997, CPO: CO, O₃, Rn, NO_x, PAN, NMHCs, aerosol scatter, absorption and CPC;**
- **Spring 1998, CPO: CO, O₃, Rn, NO_x, PAN, NMHCs, aerosol scatter, absorption and CPC;**
- **Spring 1999, King Air profiles: O₃, NO, J_NO₂, PAN, CO (cans), NMHCs (cans), aerosol scatter, absorption and CPC**



4+ publications dealing with ozone budget, role of PAN, Vertical distributions, LRT, etc.



Spring 2001 Campaign- CPO and Vertical Profiles

What's new in 2001?

- Use of small plane to get vertical profiles “on-demand” for O₃, aerosol scatter, CO and NMHCs;
- Addition of Hg(0), coarse and fine aerosol chemistry observations to CPO;
- Use of “chemical weather forecasts” for flight planning and decision making.



Vertical Profiles using Beechcraft Duchess



- Twin (piston) engine aircraft
- Unpressurized cabin
- Maximum flight altitude 6km, 4 hours useable flying time
- Maximum instrument payload ~240 kg
- Maximum instrument volume ~1.5m³
- Maximum power ~1 kw
- Available locally (Northway Aviation, 20min from lab)
- \$250/hour including pilot.



Spring 2001 Observations

Airborne: 12 Flights: 29 March 2001 – 6 May 2001

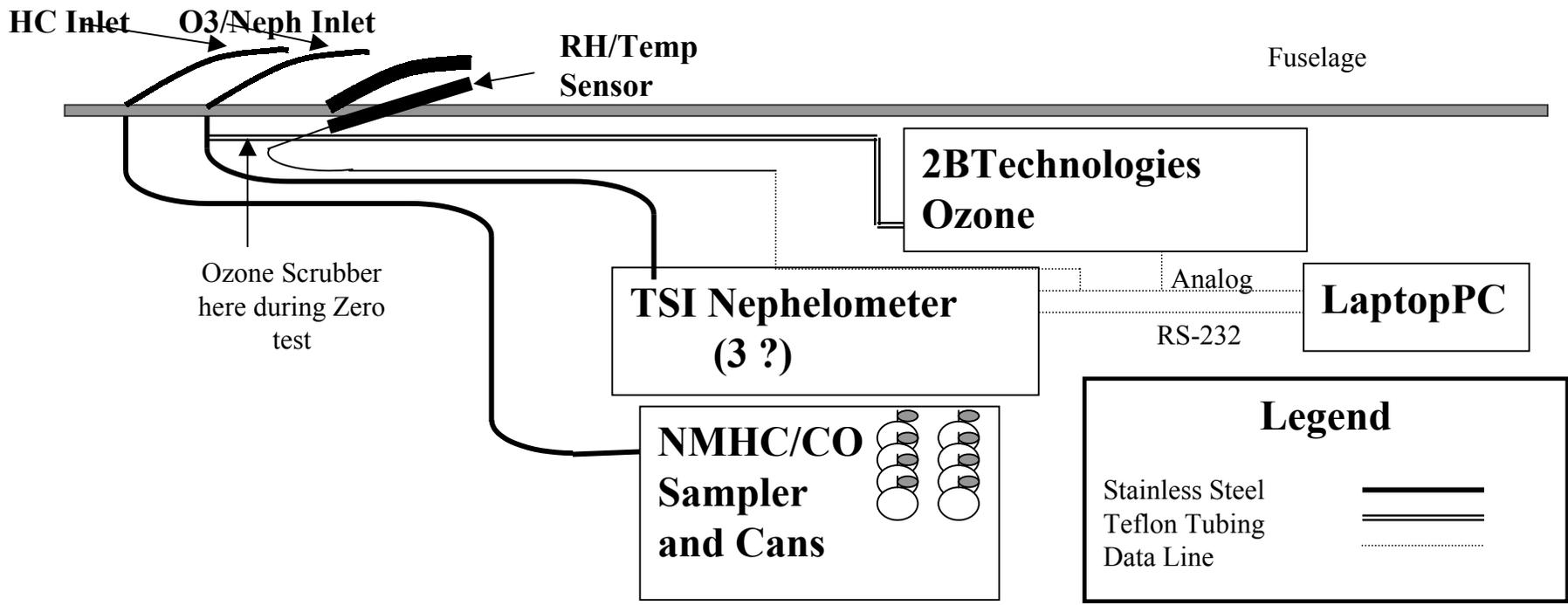
- **O₃: 2B Technologies**
- **Sub-micron aerosol scatter: TSI 3 ? nephelometer**
- **CO+NMHCs: Canisters/GC RGA, FID**
- **Temp, RH, P**

Cheeka Peak:

CO, O₃, NMHCs, Hg(0), aerosol mass+chemistry (coarse, fine);

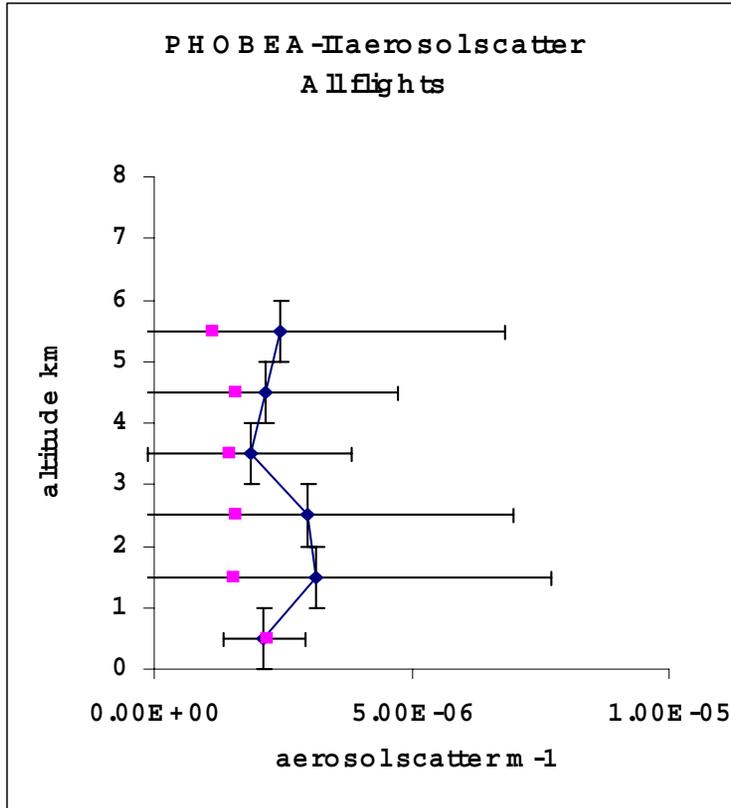


Beachcraft Duchess: Flow & Wiring Diagram

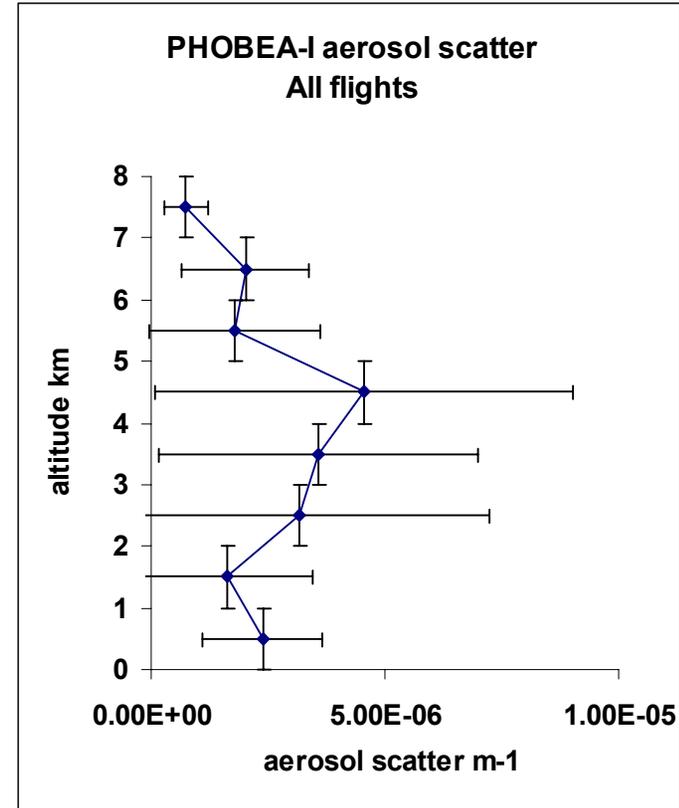


Comparing the 1999 and 2001 Profiles: Total scattering (green), ambient P,T

2001



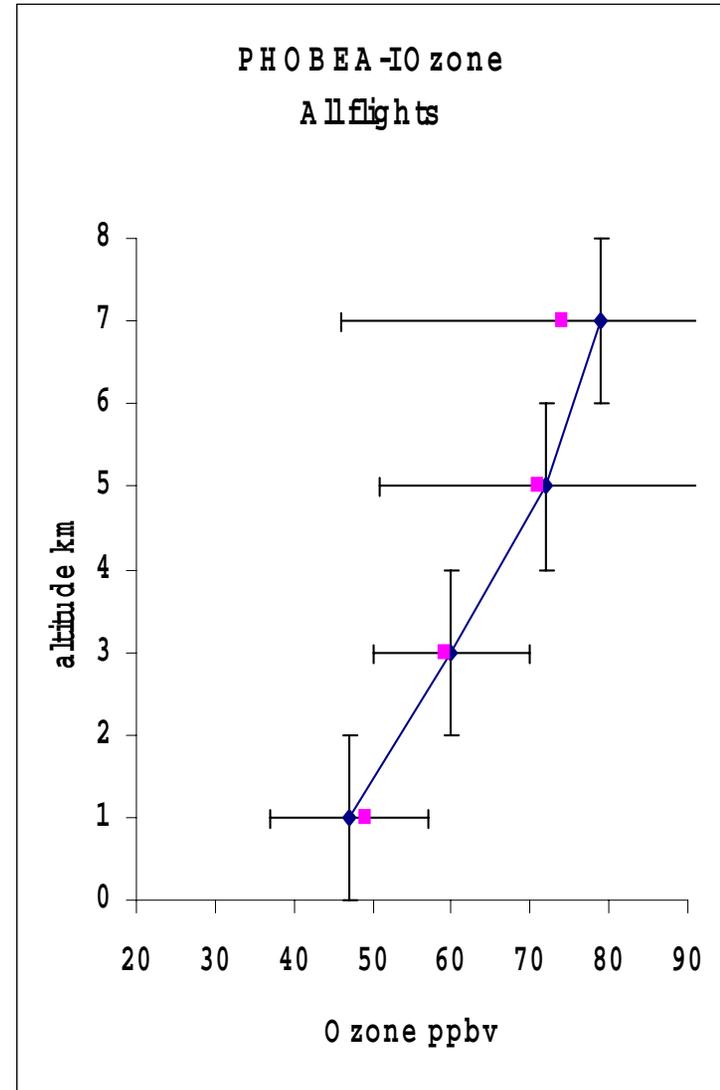
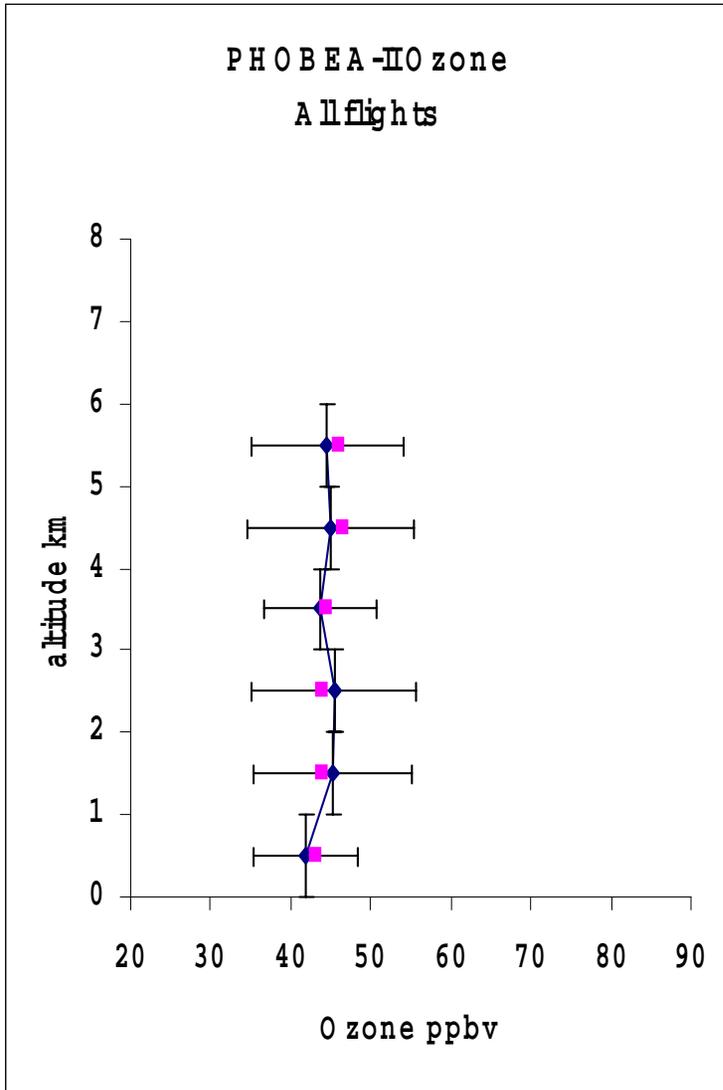
1999



Comparing the 1999 and 2001 O3 Profiles

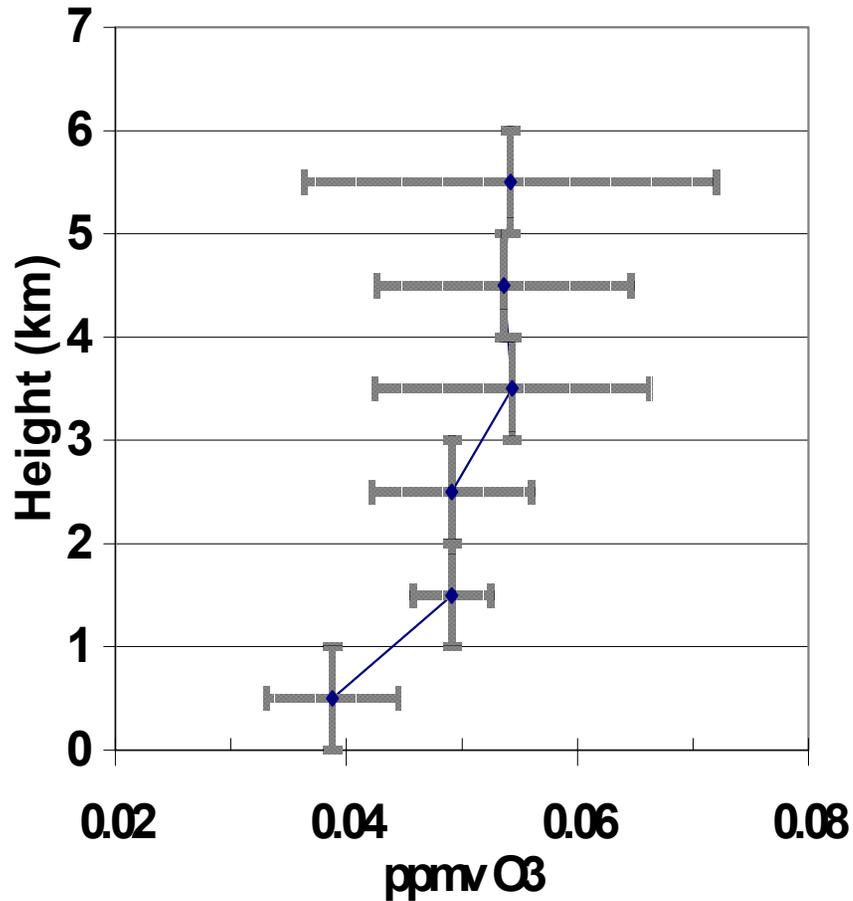
2001

1999

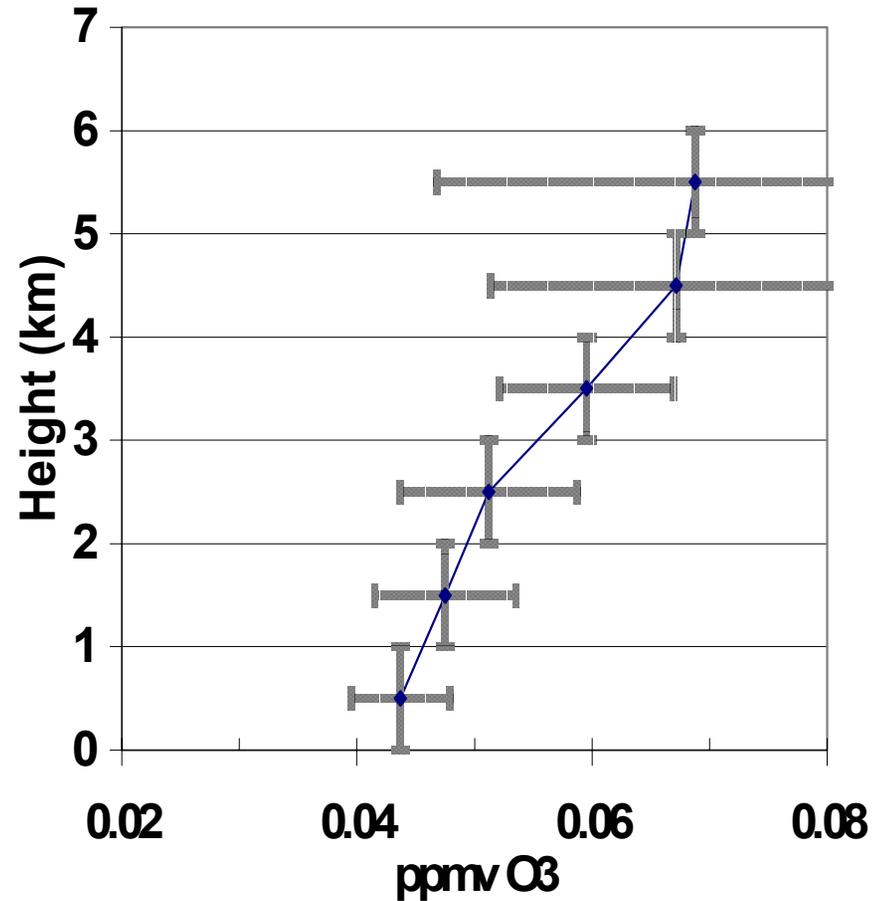


Comparison of Ozone profiles

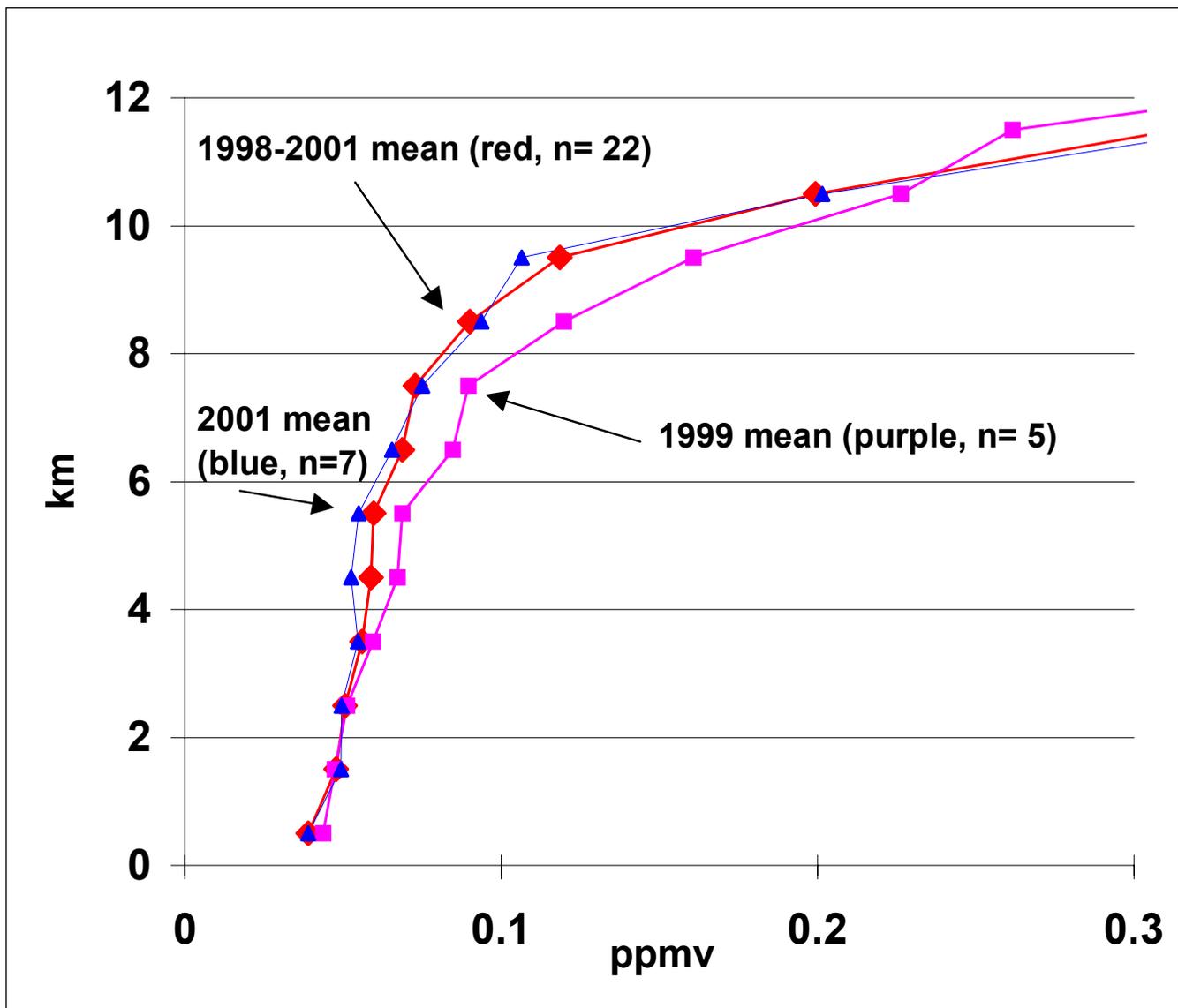
Trinidad Head: Spring 2001



Trinidad Head: Spring 1999

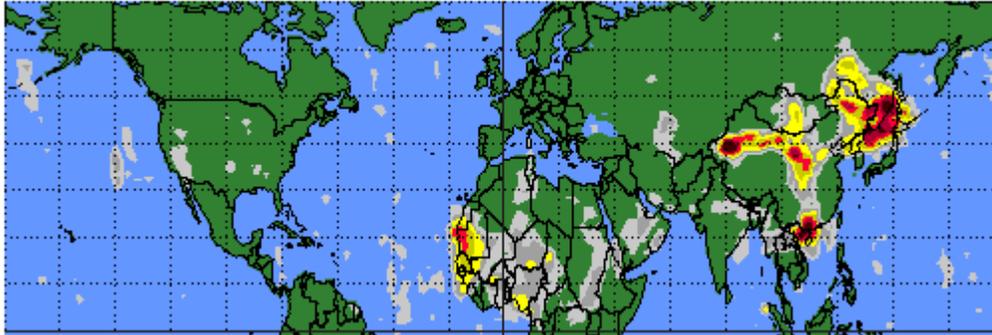


Trinidad Head spring ozonesonde data in 1 km bins

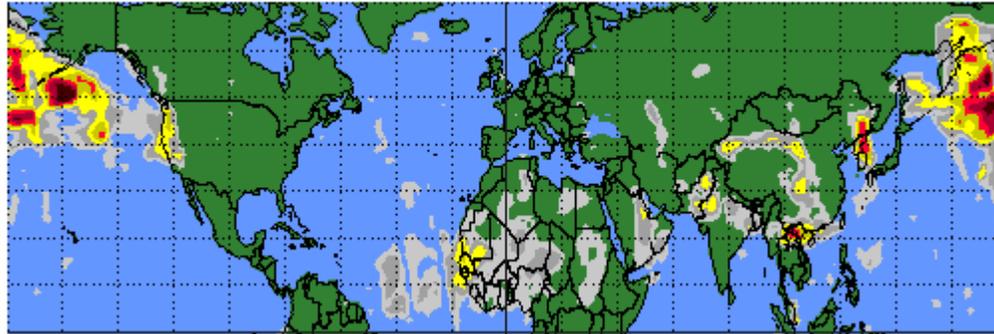


TOMS Aerosol Index (AI) for mid-April 2001

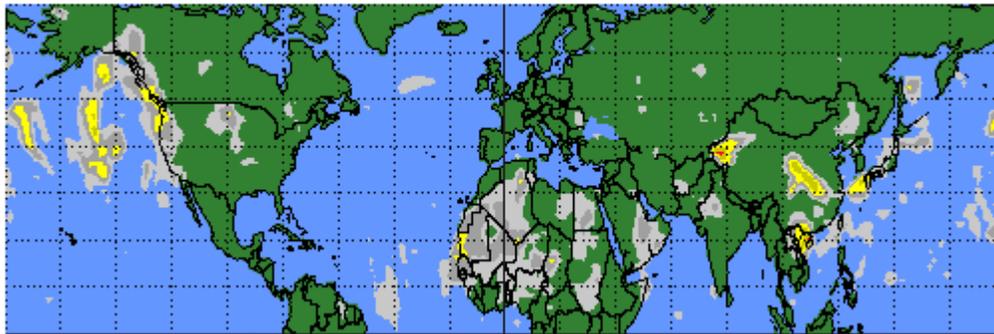
April 8, 2001



April 12, 2001

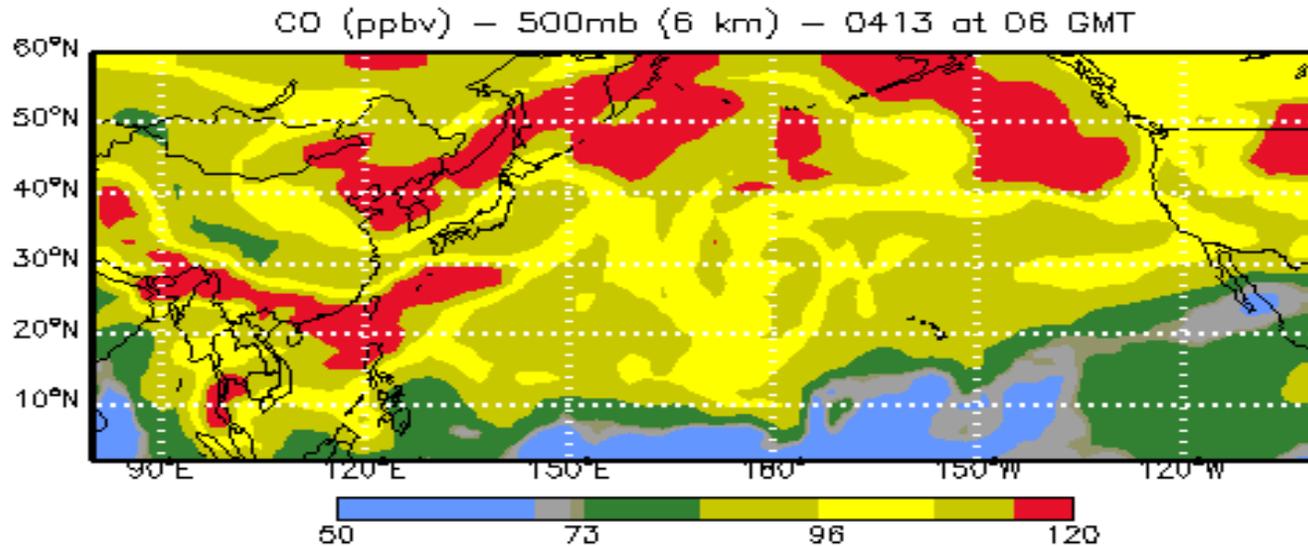


April 14, 2001



13 April 2001 GEOS-Chem CO Forecast at 500 mb

Chemical Transport Model used during TRACE-P
by Daniel Jacob and coworkers at Harvard



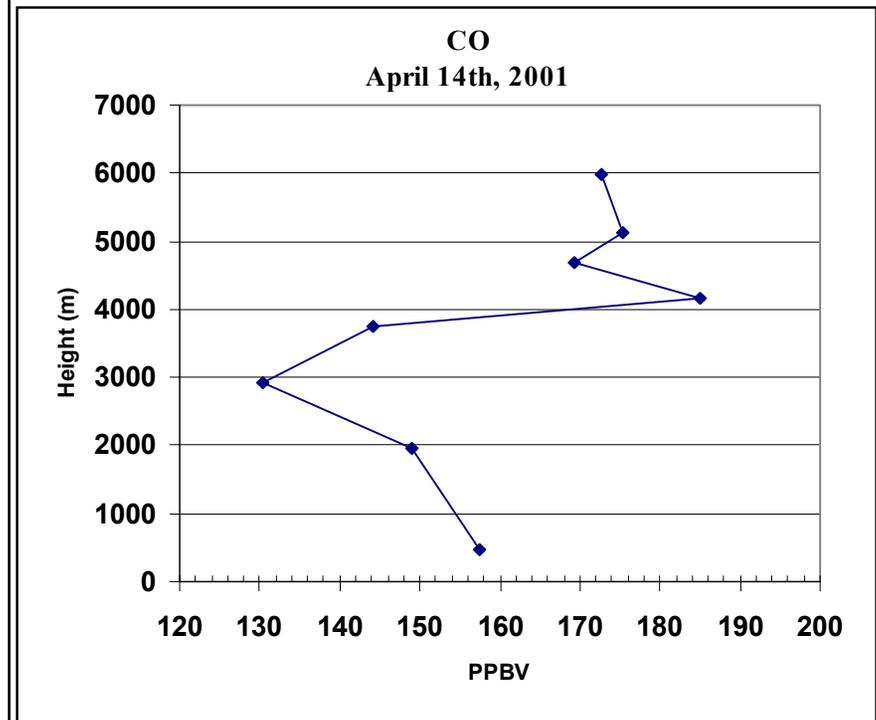
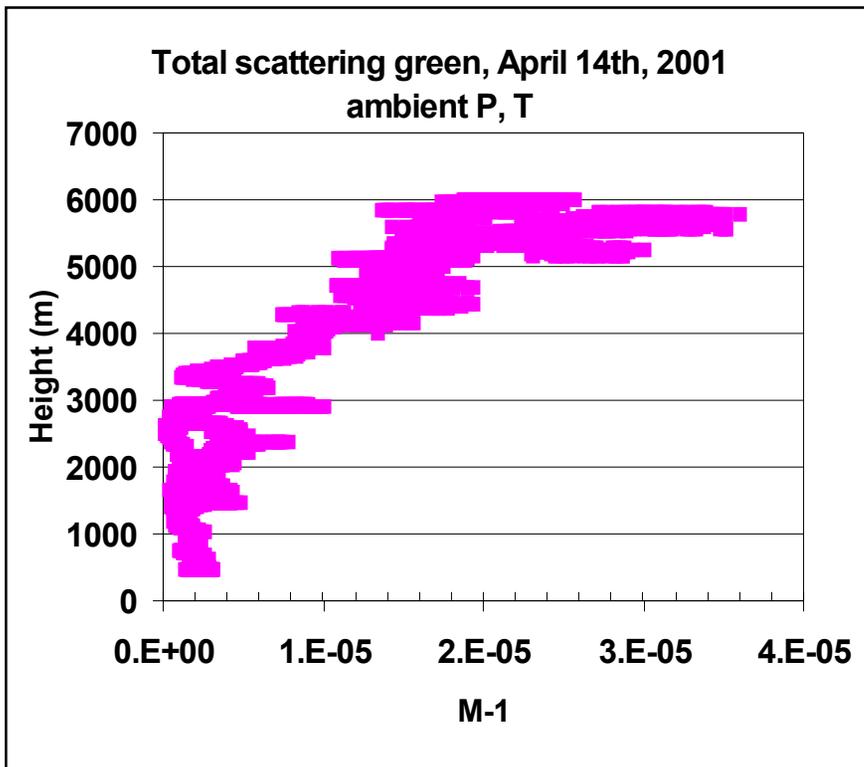
Max : 00148 ppb



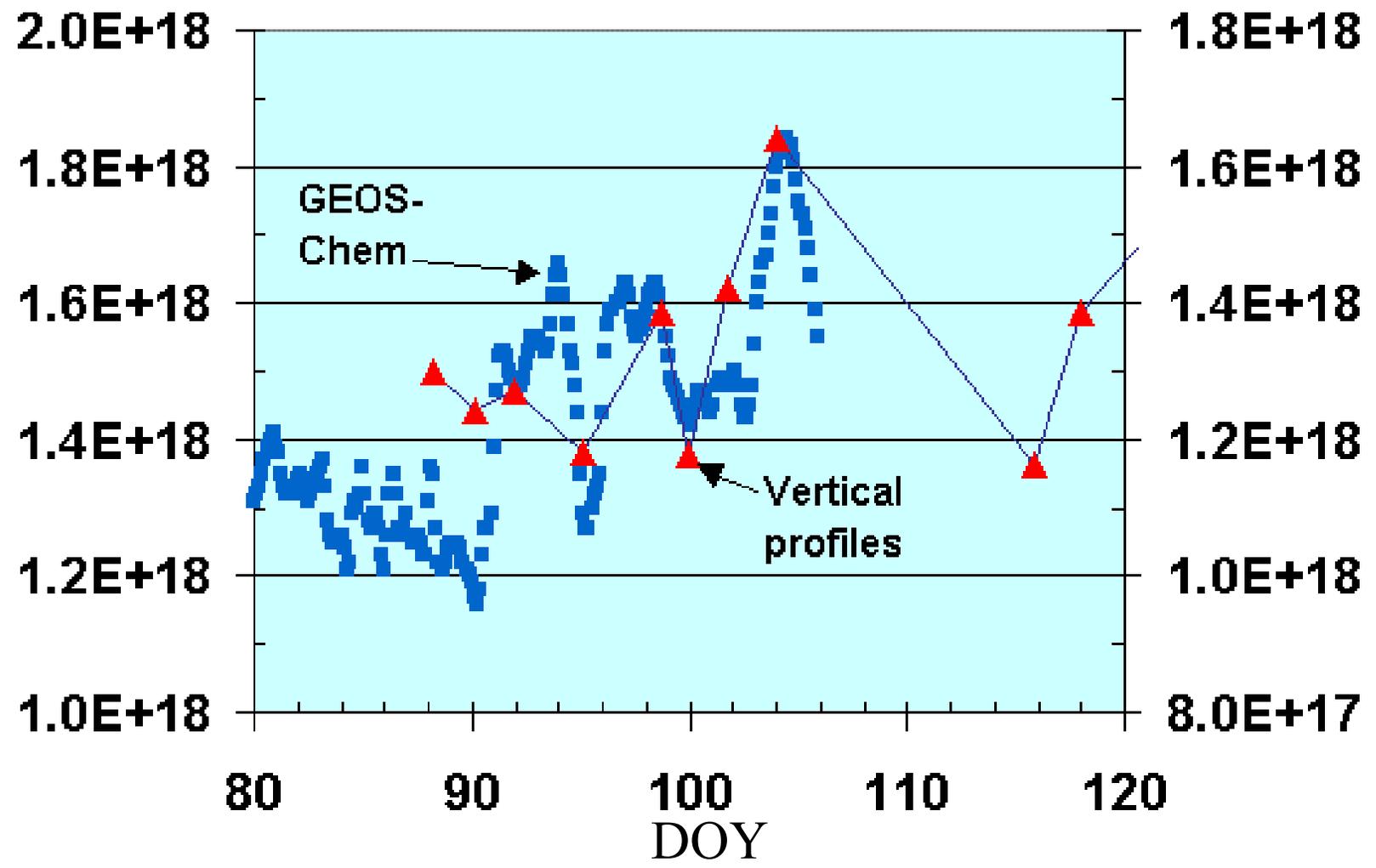
14 April 2001

CO and aerosol scatter

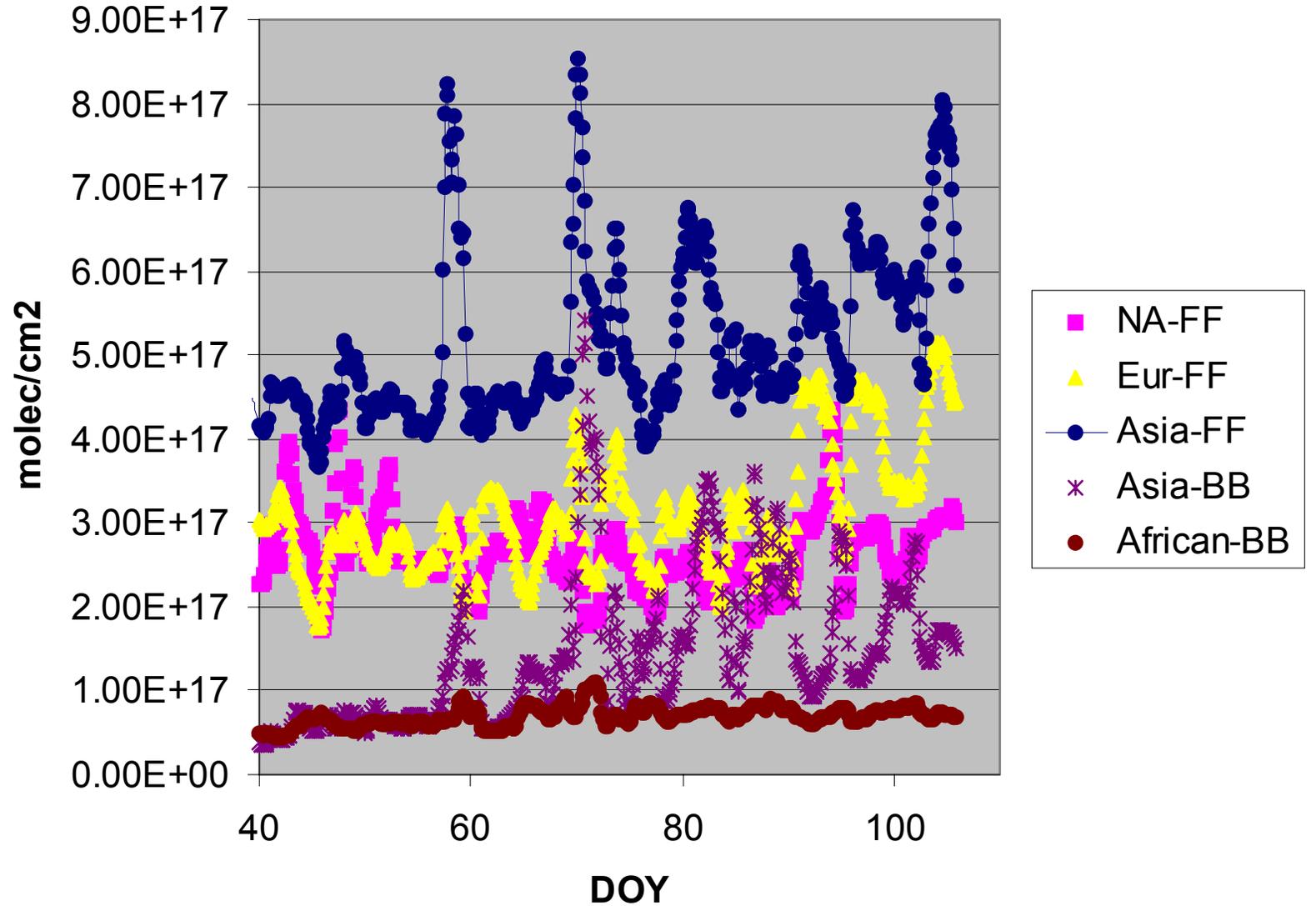
- Substantial dust event. One of the highest aerosol scattering values measured during all PHOBEA campaigns (since 1997);
- Aerosol scatter observations on the 14th from Duchess showed that most of the dust was confined to 4-6 km asl region as it arrived to the PNW;



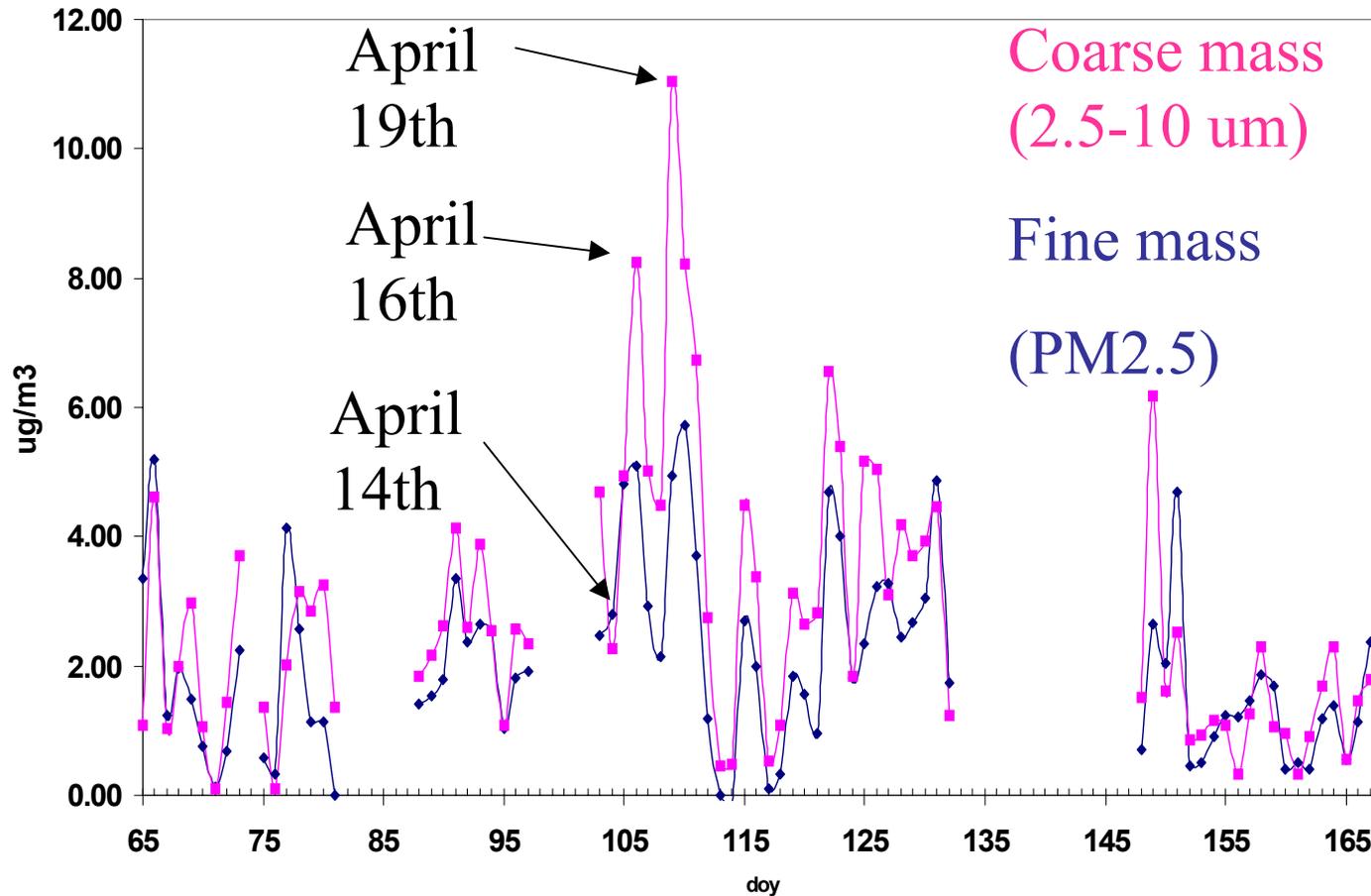
Comparison of GEOS-Chem CO Column (mol/cm² to 6 km) w/PHOBEA data



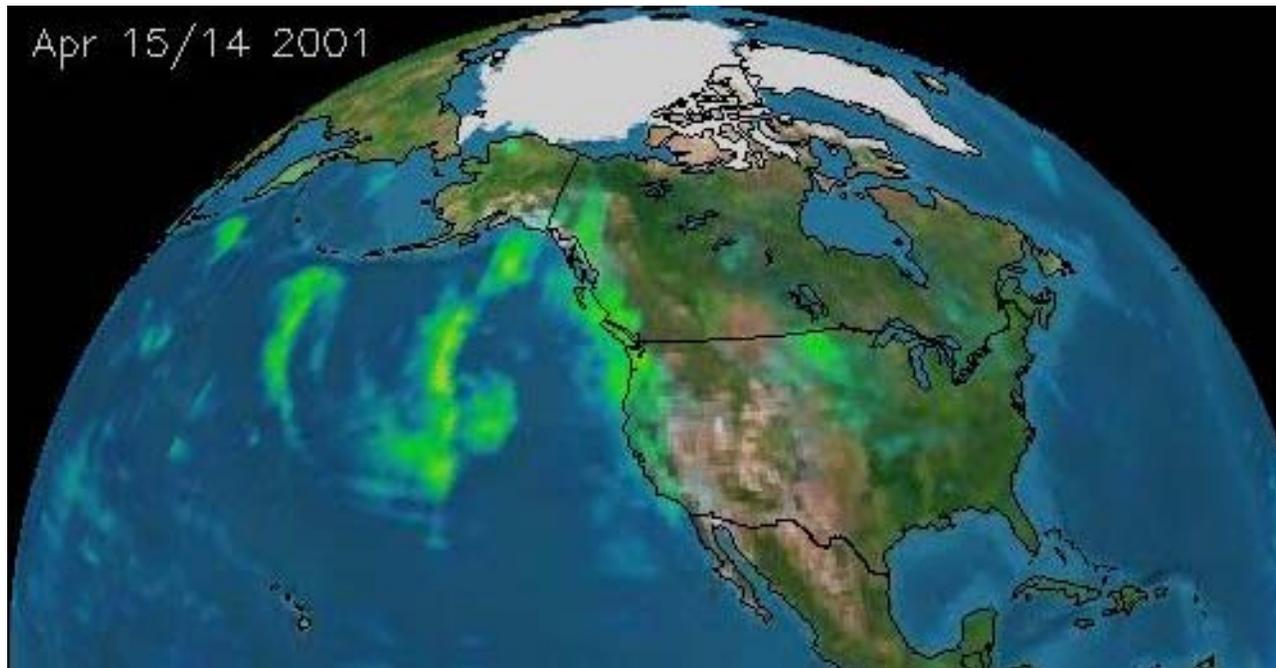
GEOS-Chem, Tagged CO



Cheeka Peak Coarse and Fine aerosol mass Spring 2001



TOMS AI: April 15th, 2001



Major science themes for PHBOEA 2001 analysis

- Comparison of observations with Transport models including GEOS-Chem (Jacob) and GOCART (Chin);
- Interannual variability in LRT (comparison of many species to 1999);
- Time and chemical evolution of April 8-14 dust/pollution episode: CO, NMHCs, O₃, aerosol scatter and consistency of NMHC loss rates (w/ T. Campos, T-Y.Chen)
- Aerosol-ozone relationship and interaction: Generally positive correlation with outliers due to strat O₃ and dust. (Sub-micron aerosol only)

